CLAIMS

I CLAIM AS MY INVENTION:

Sub A2

1. A component adapted for operation at an elevated temperature, the component comprising:

a substrate material;

a thermal barrier coating disposed on the substrate material, the thermal barrier coating further comprising:

a layer of ceramic material;

a plurality of inclusions disposed below a free surface of the ceramic material; and

a crack extending from respective ones of the plurality of the inclusions to the free surface of the ceramic material.

2. The component of claim 1, wherein the inclusions comprise a material having a coefficient of thermal expansion greater than that of the ceramic material.

3. The component of claim 1, wherein the inclusions comprise a respective plurality of voids.

4. The component of claim 1, further comprising:

the substrate material comprises a superalloy material;

the ceramic material comprises one of the group of alumina, zirconia, yttria-stabilized zirconia, and magnesia-stabilized zirconia; and

wherein the inclusions comprises a material having a coefficient of thermal expansion greater than that of the ceramic material and comprise one of the group of a polymer, ceramic, glass and metal material.

5. The component of claim 1, wherein the inclusions comprise hollow spheres of material having a coefficient of thermal expansion greater than that of the ceramic material.

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6. The component of claim 1, wherein the inclusions comprise a solid material having a coefficient of thermal expansion greater than that of the ceramic material.

7. A thermal barrier coating comprising:

a layer of a ceramic material having a free surface;

a plurality of inclusions disposed below the free surface of the layer of ceramic material;

a plurality of cracks extending from respective ones of the plurality of inclusions to the free surface.

8. The thermal barrier coating of claim 7, wherein the inclusions comprise material having a coefficient of thermal expansion greater than that of the ceramic material.

9. The thermal barrier coating of claim 7, wherein the inclusions comprise a respective plurality of voids.

10. The thermal barrier coating of claim 7, further comprising:

the ceramic material comprising one of the group of alumina, zirconia, yttria-stabilized zirconia, and magnesia-stabilized zirconia; and

the inclusions comprising a material having a coefficient of thermal expansion greater than that of the ceramic material.

11. The thermal barrier coating of claim 7, wherein the inclusions comprise a solid material having a coefficient of thermal expansion greater than that of the ceramic material.

12. The thermal barrier coating of claim 7, wherein the inclusions comprise a hollow material having a coefficient of thermal expansion greater than that of the ceramic material.

13 A method of fabricating a component having a free surface adapted for exposure to a high temperature environment, the method comprising:

providing a substrate material;

depositing a layer of ceramic material over the substrate material;

forming the layer of ceramic material to have a plurality of inclusions below a free surface opposed the substrate material, the inclusions comprising material having a coefficient of thermal expansion greater than that of the ceramic material; and

heating the layer of ceramic material and inclusions to cause a plurality of cracks to form between the respective inclusions and the free surface.

14. The method of claim 13, further comprising heating the layer of ceramic material and inclusions to a temperature sufficiently high to cause the material of the inclusions to evaporate and to diffuse through the respective cracks.

15. The method of claim 13, further comprising forming the inclusions to be hollow spheres of material.

16. The method of claim 15, further comprising:

forming the substrate from a superalloy material;

forming the layer of ceramic material from one of the group of alumina, zirconia, yttria-stabilized zirconia, and magnesia-stabilized zirconia; and

forming the inclusions from a material having a coefficient of thermal expansion greater than that of the ceramic material and comprising one of the group of a polymer, ceramic, glass and metal material.

17. A method of fabricating a thermal barrier coating, the method comprising:

selecting a thermal barrier coating matrix material;

forming inclusion particles of a material having a coefficient of thermal expansion greater than that of the thermal barrier coating matrix material;

forming a layer of the thermal barrier coating material having a plurality of the inclusion particles disposed below a free surface of the layer;

heating the layer of thermal barrier coating material and inclusion particles to cause a plurality of cracks to form between the respective inclusion particles and the free surface.

18. The method of claim 17, further comprising heating the layer of the thermal barrier coating material and inclusion particles to a temperature sufficiently high to cause the material of the inclusion particles to evaporate and to diffuse through the respective cracks.

19. The method of claim 17, further comprising forming the layer of ceramic material from one of the group of alumina, zirconia, yttria-stabilized zirconia, and magnesia-stabilized zirconia; and

forming the inclusions from a material having a coefficient of thermal expansion greater than that of the ceramic material and comprising one of the group of a polymer, ceramic, glass and metal material.

20. The method of claim 17, further comprising forming the inclusion particles to be hollow spheres.